EFFECT OF YOGIC ASANAS ON MUSCLE ACTIVATION FOR STRENGTHENING OF LOWER EXTREMITY

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Synopsis

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TABLE OF CONTENT

1. INTRODUCTION
    - 1.1 Introduction of the topic
    - 1.2 Statement of the problem
    - 1.3 Objectives of the study
    - 1.4 Limitation
    - 1.5 Delimitation
    - 1.6 Hypotheses
    - 1.7 Definition and explanation of the terms
    - 1.8 Significance of the study
2. REVIEW OF RELATED LITERATURE
3. METHODOLOGY
    - 3.1 Selection of subjects
    - 3.2 Selection of variables
    - 3.3 Criterion measures
    - 3.4 Administration of test and Collection of data
    - 3.5 Statistical technique employed in the study
4. BIBLIOGRAPHY

ABSTRACT

The present study aimed to investigate the effect of selected yogic asanas on muscle activation and strengthening of the lower extremity muscles over a six-week training period. With the growing interest in non-invasive, holistic approaches to physical training and rehabilitation, yoga has emerged as a promising modality. This study focused on evaluating specific muscle responses to a structured yoga protocol using advanced surface electromyography (sEMG) technology.

A total of 30 participants were randomly assigned to two groups: an experimental group, which received six weeks of yogic asana training, and a control group, which did not engage in any specific intervention. The experimental group practiced eight specific asanas—Utkatasana, Virabhadrasana II, UrdhvaPrasaritaEkapadasana, Dolasana (Pendulum Pose), Poorna Titali Asana (Full Butterfly), UtthitaTrikonasana, Padanguli-Sakti-Vikasaka, and Pada-Mula-Sakti-Vikasaka—chosen for their engagement of key lower limb muscle groups.

The study focused on eight primary muscles of the lower extremity: Vastus Lateralis, Vastus Medialis, Biceps Femoris, Semitendinosus, Adductor Longus, Gracilis, Gastrocnemius, and Soleus. Pre- and post-intervention muscle activation was measured using the BTS FreeEMG system, a wireless electromyography device offering precise and real-time data on muscle response and neuromuscular coordination.

The statistical analysis revealed that the experimental group exhibited a significant increase in muscle activation levels ($p < 0.05$) across all eight muscles compared to the control group, which showed no notable change. The Vastus Medialis and Gastrocnemius showed the highest improvement, indicating enhanced quadriceps and calf engagement due to the intervention. These results suggest that regular practice of selected yogic asanas not only improves flexibility and balance but also significantly contributes to neuromuscular strengthening of the lower extremities.

The study concludes that yoga-based interventions, when applied systematically, can effectively activate and strengthen lower limb muscles. These findings hold potential implications for sports training, injury prevention, rehabilitation, geriatric care, and physiotherapy. The research adds to the growing body of evidence supporting yoga as a scientifically valid and impactful practice in the field of exercise science, biomechanics, and physical education.

Keywords: EMG, Yogasana, Muscle strength, Lower limbs, Biomechanics.

CHAPTER-I

INTRODUCTION

There are two possible methods in the practice of asana: Static and dynamic. Static here means maintaining the final position of asana for a period of time (say, 1–3 min), and dynamic would imply move in and out of the final pose in quick succession. In exercises also, we have these two ways of carrying out an exercise regimen. While exercise, physiologists recommend different ways of executing exercises based on a person's requirements; similar consideration should also steer what types of asana a person should carry out and whether to do them statically or dynamically. Each has specific benefit with respect to neuromuscular rehabilitation.(Srinivasan, 2016). Asana practice is important in achieving rehabilitation of neuromuscular problems. This might seem simple; however, the physiology is fairly complex. The amount of stretch could also be monitored through H-reflex monitoring that is seen as a late component in electromyogram studies. Studies conducted to examine muscle stretch through H-reflex gives an idea of the amount of reflex recruitment and the integrity of the feedback mechanisms in the muscle(Srinivasan, 2016).

Andersen et al suggest that an adaptive threshold of 40% to 60% of maximal effort is necessary to strengthen muscle during therapeutic exercise.(Ayotte et al., 2007)

Standing yoga poses strengthen a person’s legs and helps to achieve the goal of musculoskeletal rehabilitation, but inadequate exercise planning can cause injuries (Liu et al., 2021). There were 2123 muscle injuries documented in the major lower extremity muscle groups; adductors (n=523), hamstrings (n=900), quadriceps (n=394), and calf (n=306)(Hägglund et al., 2013). Muscle lesions are the most common category of injuries in athletes, accounting for more than 30% of injuries in soccer players(Isern-Kebschull et al., 2020). Muscle injuries in professional players are usually indirect injuries that occur during eccentric muscle contraction. Striated muscle tissue stands out for its great contractile function related to the connective tissue (Isern-Kebschull et al., 2020). The connective tissue distribution is different in each muscle, varying in location and thickness depending on the muscle’s function. However, in addition to being a force transmitter during contraction, the connective tissue acts as a structural component in the case of fascias or raphes (Isern-Kebschull et al., 2020). The most frequent mechanism of lower limb

muscle injuries is an indirect injury (muscle strain) associated with both sprinting and stretching activities. The myotendinous or the myofascial/myoaponeurotic junction that represents the structurally weakest portion of the muscleis is usually affected . Clinically, muscle strains are characterized by a sudden onset of pain usually localized in a specific muscle compartment during a period of eccentric contraction, which, depending on severity, may immediately prevent the athlete from continuing the sports activity (Isern-Kebschull et al., 2020). Blunt trauma is the most common mechanism of direct muscle injuries in sports that involve collisions such as soccer, football, or rugby(Isern-Kebschull et al., 2020). Acute or recent muscle injuries are characterized by edema, vascular engorgement, and inflammatory cellular infiltration (Isern-Kebschull et al., 2020). Independent of the mechanism of injury, more than 90% of muscle injuries of the lower limb in football players affect four muscle groups (hamstrings, quadriceps, adductors, and calf muscles)(Isern-Kebschull et al., 2020). The benefits of strength training are strongly associated with different components of physical and mental health including reduced symptoms of depression, decreased lower back pain, and improved vascular condition, movement control and bone density as well as enhanced self-esteem, among others. In addition, strength training can lead to significant differences in athletic performance by promoting greater force production, postural strength, ability to respond to stretch shortening cycles, and an increasing force development rate, which can result in faster muscle activation(Martín-Fuentes et al., 2020). Although the selection of strength training exercises depends on the fitness goals (e.g., hypertrophy, performance, or injury prevention, among others), muscle activation patterns need to be considered. This is because greater muscle activation, and with it greater surface electromyographic (sEMG) amplitude and a greater number of motor units recruited, is normally essential for motor control, skills improvement, and strength and power development(Martín-Fuentes et al., 2020). In humans, the force of a muscle contraction is partly regulated by the number, frequency, and synchronization of the motor units recruited(Martín-Fuentes et al., 2020). Low threshold motor units are mainly recruited in low intensity exercises, whereas both low and high threshold motor units are recruited during high intensity exercises or low intensity exercises performed to task failure(Martín-Fuentes et al., 2020).

Consequently, surface electromyography, which consists of a very sensitive voltmeter that detects increases and decreases in voltage on the sarcolemma, has become a common research tool in sports sciences for measuring muscle activation(Martín-Fuentes et al., 2020). Biomedical

signal means a collective electrical signal acquired from any organ that represents a physical variable of interest(Reaz et al., 2006). This signal is normally a function of time and is describable in terms of its amplitude, frequency and phase. The EMG signal is a biomedical signal that measures electrical currents generated in muscles during its contraction representing neuromuscular activities(Reaz et al., 2006). The nervous system always controls the muscle activity (contraction/relaxation)(Reaz et al., 2006). Hence, the EMG signal is a complicated signal, which is controlled by the nervous system and is dependent on the anatomical and physiological properties of muscles(Reaz et al., 2006). The main reason for the interest in EMG signal analysis is in clinical diagnosis and biomedical applications(Reaz et al., 2006). The field of management and rehabilitation of motor disability is identified as one of the important application areas. The shapes and firing rates of Motor Unit Action Potentials (MUAPs) in EMG signals provide an important source of information for the diagnosis of neuromuscular disorders(Reaz et al., 2006).

Rehabilitation or performance enhancement training should be based on the principle that specific imposed demands on the musculoskeletal system will produce specific adaptations within the system (Ekstrom et al.,2007). Exercises designed to increase strength or endurance should target specific muscle groups that are weak or are important to the activities in which the individual wants to participate(Ekstrom et al., 2007). A clinician should be able to establish a specific exercise program that includes optimal exercise positions to target specific identified muscular performance deficits. Electromyographic (EMG) analysis can provide information as to the relative amount of muscular activity an exercise requires, as well as the optimal positioning for the exercise(Ekstrom et al., 2007). Researchers have recently reported on the importance of specific trunk, hip, and thigh muscle strengthening and endurance/stabilization training for the prevention of athletic injuries.Weakness and poor endurance of the lumbar extensor, gluteus maximus, and hip external rotator muscles have also been noted in individuals with lower extremity injuries and low back pain(Ekstrom et al., 2007). Athletes who were not injured had stronger hip abductor and external rotator muscles. It has also been reported that females with patellofemoral joint pain have weaker hip abductors, extensors, and external rotators as compared to age-matched controls(Ekstrom et al.,2007). A case series including 2 patients, reported that strengthening these muscles resulted in a significant improvement in patella femoral pain, lower extremity kinematics, and return to function(Ekstrom et al., 2007).

Based on the amplitude of the EMG signal, a judgment can be made about exercises that may be beneficial for strengthening and those that may be more beneficial for endurance or stabilization training.When the surface EMG signal is rectified and smoothed, its amplitude is generally positively related to the amount of force produced by the muscle.20 Investigators have reported both linear and nonlinear relationships between EMG signal amplitude and increasing force production during isometric contractions(Ekstrom et al.,2007).

Hamstring strain injury is common in many sports, strength and conditioning professionals actively seek additional techniques to improve hamstring strength with the aim of minimising the incidence of hamstring strain injury(O' Brien et al.,2022).Benefits of yoga include increased circulation, improved respiration, improved cardiac function, improved mental well being and focus, increased flexibility and increased muscle strength(Kelley et al., 2019).Although studies exist examining the effects of yoga, a paucity of literature exists using surface electromyography (EMG) to quantify muscle output during yoga poses (asana)(Kelley et al., 2019).

Utkatasana,utakata means powerful,fierce,uneven.This asana is like sitting on an imaginary chair.the pose removes stiffness in the shoulders and corrects any minor deformities in the legs. The ankles become strong and the leg muscles develop evenly (Iyengar, 2014).

Virabhadrasana II, through this poses the leg muscles become shapely and stronger.it relieves cramp in the calf and thigh muscles, bring elasticity to the leg and back muscle and also tone the abdominal organs.(Iyengar, 2014)

Urdhvaprasaritaekapadasana six, This asana tones the leg muscles and reduces fat around the hips.(Iyengar, 2014)

Dolasana (pendulum pose),This asana strengthens the hamstrings and back muscles, makes the back supple and tones the spinal nerves.(Satyānanda, 2009)

Poorna Titali Asana (full butterfly),This asana inner thigh muscles hold a lot of tension which is relieved by these asanas.(Satyānanda, 2009)

Utthitatrikasan (Extended triangle poses):It helps to strengthen the pelvic floor muscles, thighs and gastrosoleus(calf) muscles. It enhances the digestion and aids in flexibility of spine(Sharma, 2020).

Padanguli-Sakti-Vikasaka, This asana strengthens and tones up the leg muscles, knee joints and toes.(Singh & Mukesh, 2010)

Pada-Mula-Sakti-Vikasaka, this asana strengthens and tones up the leg muscles, knee joints and toes.(Singh & Mukesh, 2010)

Yoga plays a vital role in human body.Many studies and systematic reviews of yoga are being published with evidence of its health promoting abilities .The review concluded that muscle contraction is an important factor in strengthening muscles. The study will analyze the effect of asanaon muscle activation of selected muscles. This study will provide a new dimension to strength training using isometric protocol from the light of yogic postures.

STATEMENT OF THE PROBBLEM

The problem is stated as **"EFFECT OF YOGIC ASANAS ON MUSCLE ACTIVATION FOR STRENGTHENING OF LOWER EXTREMITY".**

OBJECTIVE(S) OF STUDY

1. To determine the pre and post peak muscle activation of selected muscles of lower limbduring yogic asana.
2. To determine the pre and postaverage muscle activation of selected muscles in lower limb during yogic asana.
3. To compare the contribution of muscular activation among selected muscles in lower limb during selectedasana.
4. To investigate the relationship betweenpeak activation of selected muscles of lower limb andperformance of asana.
5. To determine the training effect of yogic asanas on the muscular activation of lower extremity.
6. To investigate the relationship between average activation of selected muscles of lower limb and performance of asana.

LIMITATIONS OF THE STUDY

The meteorological factors like environmental temperature, atmospheric pressure are beyond the control of researcher.

Size of the muscle, muscle fiber type and genetics will be considered as limitation of the present study.

DELIMITATIONS

1. The study will be delimited to 30 Intervarsitymale yoga practionersfrom LNIPE,GWALIOR.
2. The study will be delimited to the age group from 18 to 25 years.
3. The muscle activity will be recordedin Static yoga position.(Final position of holding)
4. The study will be delimited to the Bilateral Extremity.(Lower Limbs only)
5. The study will be delimited to following muscles

a) Vastuslateralis,
b) Vastus Medialis
c) Biceps femoris,
d) Semitendinosus,
e) Adductors longus,
f) Gracilis
g) Gastrocnemius.
h) Soleus

6. The study will be delimited to following asanas

a) Utkatasana
b) Virabhadrasana II
c) Urdhvaprasaritaekapadasana six
d) Dolasana (pendulum pose)
e) Poorna Titali Asana (full butterfly)
f) Utthitatrikasan (Extended triangle pose)
g) Padanguli-Sakti-Vikasaka

h) Pada-Mula-Sakti-Vikasaka

HYPOTHESES

a) It is hypothesized that there will be significantrelationship between peak activation of selected muscles of lower limb and performance of asana.
b) It is hypothesized that there will be significant effect of training of yogic asanas on muscle activation of selected muscle.
c) It is hypothesized that there will be significant relationship between average activation of selected muscles of lower limb and performance of asana.

Definition and explanation of the terms

Yoga: Yoga is not an ancient myth buried in oblivion. It is the most valuable inheritance of the present. It is the essential need of today and the culture of tomorrow.

- Swami Satyananda Saraswati,

Yoga is the science of right living and, as such, is intended to be incorporated in daily life. It works on all aspects of the person: the physical, vital, mental, emotional, psychic and spiritual.(Satyānanda, 2009).

There are two possible methods in the practice of asanas: Static and dynamic. Static here means maintaining the final position of asanas for a period of time (say, 1–3 min), and dynamic would imply move in and out of the final pose in quick succession. In exercises also, we have these two ways of carrying out an exercise regimen. While exercise, physiologists recommend different ways of executing exercises based on a person's requirements; similar consideration should also steer what types of asanas a person should carry out and whether to do them statically or dynamically. Each has specific benefit with respect to neuromuscular rehabilitation.(Srinivasan, 2016).

EMG:ELECTROMYOGRAPHICAL,surface electromyography, which consists of a very sensitive voltmeter that detects increases and decreases in voltage on the sarcolemma, has

become a common research tool in sports sciences for measuring muscle activation(Martín-Fuentes et al., 2020).

SIGNIFICANCE OF THE STUDY

1. The finding of present study will help to educate the coaches and players to know about the muscles used in different types of Yoga posture.
2. The finding of the study will help to form the basis of efficient structure of training.
3. To develop the specific muscle group, this has great role in executing the yoga asana.
4. The finding of present study will help to prevent the lower limb injury by keeping proper attention on the muscles which is more used while executing the asanas.
5. The finding will add a new knowledge in the field of research of physical education, sports and yogic science.
6. The findings of the study will provide a guide-line to the future research investigators in sports Physiological and sports Biomechanics to conduct further research in this field.
7. The findings of the study may add knowledge& literature to physical education.

CHAPTER - II
REVIEW OF RELATED LITERATURES

The effort has been made by the researcher to locate literature related to this study. The relevant studies found from various, sources, which the researcher has come across, are citied below.

Kelley et al.(2019) In this study, surface electromyography was used to compare the muscle activation of the anterior tibialis (TA), gastronomies (GA), rectus femoris (RF) and biceps femoris (BF) during several yoga poses: tree pose (Vrksashana), half moon pose (Ardha Chandrasana) and warrior III (Virabadrasana) with a rest pose (Mountain pose). Ten healthy females with more than 3 months of continuous yoga experience who practiced at least 1.5 hours per week were recruited. EMG activity were recorded from the aforementioned muscles during mountain pose ("rest") for 30 seconds, three times. Subjects then performed the following yoga poses in a randomized sequence while surface EMG activity was recorded: tree pose, half-moon, and warrior three. The study revealed significantly greater EMG activity in TA and GA in all three poses when compared to BF and RF. BF produced greater EMG activity than RF in warrior III. In conclusion, single limb yoga poses require increased use of the ankle musculature when compared to thigh musculature(Kelley et al., 2019).

EKSTROM et al. (2007)to determine which exercises would be most appropriate for strength development and which would be more appropriate for endurance or stabilization.

Surface EMG analysis was carried out in 19 males and 11 females while performing the following 9 exercises: active hip abduction, bridge, unilateral-bridge, side-bridge, prone-bridge on elbows and toes, quadruped arm/lower extremity lift, lateral step-up, standing lunge, and using the Dynamic Edge. The rectus abdominis, external oblique abdominis, longissimus thoracis, lumbar multifidus, gluteus maximus, gluteus medius, vastus medialis obliquus, and hamstring muscles were studied.

In healthy subjects, the lateral step-up and the lunge exercises produced EMG levels greater than 45% maximum voluntary isometric contraction (MVIC) in the vastus medialis obliquus, which suggests that they may be beneficial for strengthening that muscle. The side-bridge exercise could be used for strengthening the gluteus medius and the external oblique abdominis muscles, and the quadruped arm/lower extremity lift exercise may help strengthen the gluteus maximus

muscle. All the other exercises produced EMG levels less than 45% MVIC, so they may be more beneficial for training endurance or stabilization in healthy subjects.

Our results suggest that these exercises could be used for a core rehabilitation or performance enhancement program. Depending on the individual needs of a patient or athlete, some of the exercises may be more beneficial than others for achieving strength(Ekstrom et al., 2007).

Sharma et al. (2020) Pregnancy is a phase of changes in whole body of a woman which includes physical, physiological, psychological changes. As females, now a day are more concerned about our health which was previously neglected area. In Asian countries the trend of female health concerns has consistently been growing in past few years. So, this chapter highlights about how Yoga can act as a multidimensional tool to tackle physical, physiological and psychological challenges faced by a pregnant woman. As well as discuss various yoga asana that can help prevent pregnancy-induced pelvic instabilities during different stages of pregnancy.

Yoga plays an important role in coping up with these physiological changes according to different phases of Pregnancy. In Antenatal phase, yoga focuses on coping up with the stress caused by addition of extra weight to the mother's body. It relaxes body and mind. In Perinatal phase, yoga helps with easy delivery and labor and in the Postnatal phase, yoga focuses on bringing back the body to its pre-pregnancy status.

Pregnancy is Associated with not only changes in Physical appearance but leads to many changes in Physiological, Psychological, Emotional systems of the Body.(Sharma, 2020).

Liu et al. (2021) Standing yoga poses strengthen a person's legs and helps to achieve the goal of musculoskeletal rehabilitation, but inadequate exercise planning can cause injuries. This study investigated changes in the electromyogram and joint moments of force (JMOFs) of lower extremities during common standing yoga poses in order to explore the feasibility and possible injury risk in dealing with musculoskeletal problems. Eleven yoga instructors were recruited to execute five yoga poses (Chair, Tree, Warrior 1, 2, and 3).

The results revealed significant differences in hip, knee, and ankle JMOFs and varying degrees of muscle activation among the poses. Among these poses, rectus femoris muscle activation during the Chair pose was the highest; Warrior 2 produced the highest muscle activation in the vastus lateralis of the front limb, while Warrior 1 had the highest muscle activation in the vastus medialis of the back limb.

Therefore, all three poses can possibly be suggested as a therapeutic intervention for quadriceps strengthening. Warrior 1 was possibly suggested as a therapeutic intervention in order to reduce excessive lateral overload of the patella, but the possible adverse effects of Warrior 2 with the highest knee adductor JMOF in the back limb could raise joint reaction forces across the medial condyles. In single-leg balance postures, Warrior 3 had unique training effects on the hamstring, and is therefore suggested as a part of hamstring rehabilitation exercises.

The Tree pose induced low lower-extremity JMOFs and a low level of thigh muscle activations when it was performed by senior instructors with excellent balance control; however, for yoga beginners with insufficient stability, it will be a useful training mode for strengthening the muscles that help to keep one upright. This study quantified the physical demands of yoga poses using biomechanical data and elucidated the structures and principles underlying each yoga movement. This is crucial for yoga practitioners.(Liu et al., 2021).

Sahai et al. (2019) Yoga is an ancient science which is practiced by an individual as a physical and mental exercise to become fit and healthy. In current study we perform various YOGA exercises to see its effects on various physiological parameters. The main objective of this study is to analyze the effect of karma yoga on physical (strength of quadriceps group of muscles) and physiological parameters such as blood oxygen saturation level (SpO2), heart rate and blood pressure.

Healthy subjects are selected randomly for yoga session. SpO2, heart rates are measured using pulse oximeter and blood pressure using blood pressure apparatus. We used Electromyogram (EMG) acquisition and analysis software to acquire EMG signal from the quadriceps muscle.

The variations in the physical and physiological parameters after performing karma yoga for a period of time are observed. The study concludes that there is a significant improvement in the strength of quadricep muscle but reduction in the pulse rate, SpO2, systolic and diastolic blood pressure after practicing the scheduled yoga. The significant results of these experiments show that if yoga exercises will be performed by any individual then its helps in improving their physiological parameters.(“Effect of Yoga on Physical and Physiological Parameters,” 2019).

CHAPTER III

METHODOLOGY

In this chapter the selection of subjects, selection of variables, criterion measures, administration of test and statistical technique will be employed.

SELECTION OF THE SUBJECTS

Twelvemale students of Lakshmibai National Institute of Physical Education will be selected who have participated inIntervarsitycompetition. Hence, purposive sampling willconsidered for selection of subjects. The age of subjects ranged from 18-25 years.

SELECTION OF VARIABLES

Keeping the feasibility criterion in mind, expert opinion in the field of yoga, Sports Biomechanics, Sports Physiology and Scholar's own understanding, Major Muscles selected for the purpose of the study are as following:

Quadriceps muscles Groups:

1.Vastus lateralis

2.vastus medialis

Hamstring muscles groups:

1.Biceps femoris

2. Semitendinosus

Adductors muscles groups:

1. Adductors longus

2.Adductors magnes

Calf muscles:

1. Gastrocnemius

2.Soleus

Criterion Measures

For the purpose of present study, the subjected will be tested by Free EMG BTS system (16 Channel) for the data of muscular activation.The program allows you to synchronize data sampling measurement digital filtering and initial implementation of the transferring data to computer. The digital signal representing the measured EMG activity is sent to computer.

ADMINISTRATION OF TEST

Electromyography Test

On the day of testing each subject was oriented to the testing protocol. The protocol was sequenced as follows:

1. Warm-up

2. Electrode placement

3. Practice & familiarization

4. EMG equipment and Processing

5. Analyzing procedure of asana.

Warm-up:-

Proper time will be given to the subjects for general warm-up as well as for specific warm-up.

Electrode placement: Site preparation for the Electrode Interface included shaving of the area, and cleaned by an alcohol soaked pad. The skin preparation will elicit a slight histochemical effect. (Dr. Scott, www.bortec.ca).

In the interest of minimizing contamination of the recordings, the following principles were considered when selecting the appropriate sites for electrode placement.

1. Minimize the chance of other muscles being recorded and maximize the isolation of the selected muscle through anatomical consideration.
2. A position of the electrodes will parallel to the muscle fibers.
3. Places the electrodes slightly off center to assure that the motor points were not straddled.
4. Be consistent with the electrode placements and use anatomical landmarks to facilitate the reproductability.
5. Be sensitive to anatomical differences and be flexible when using standardized electrode placement protocols.
6. Keep the electrode size and placement consistent to allow adequate isolation of selected muscle, while decreasing the amount of activity picked up from the surrounding musculature.
7. Leads and cables are kept as short as possible and be shielded to prevent any anti lacks from the surrounding structures.
8. EMG recording electrodes was placed according to referenced muscle placement for the most effective measurement. To ensure continuing with electrode placement, the same investigation was placing all electrodes.

Practice and Familiarization

The subjects was asked to do warm-up followed by electrode placement, then each subject was instructed how to perform Yogasana. The technique will be first demonstrated by a research scholar. Then the subject will practice and demonstrated technique, securing corrective feedback as needed.

Qualitative analysis of Asana:

The yoga exercise will be conducted under the supervision of a yoga expert. Each asana holds for 30 seconds. The scales are rated 10 points to determine the strength of the asana. During the expert evaluation, the asanawere graded according to the yoga poster, stability of asana, breathing frequency of the subject, balance of asana, and facial expressions of the subject.

TRAINING PROGRAMME

During the training period, asana for six days per week for 6 weeks of the training programmed. In every day training session, the work out will be approximately up to an hour, which included warming up and stretching exercises.The training program will be carried out under the supervision of the researcher.

The data will be collected intwo phases along with the intervention:

Phase-I: Pretest

Phase-II: Experimental Treatment Programme

Phase-III: Post-test

PHASE-I: PRETEST

The technique will be first demonstrated by a research scholar. The subjects will be asked to do warm-up followed by electrode placement, then each subject willinstructedto perform Yogasana one by one and clouted the data.

PHASE-II: EXPERIMENTAL TREATMENT PROGRAMM

The training protocol will be practiced by the subjects thrice in a week. The intensity of the selected Experimental Treatment programmed was for 60 minutes (one hour) per day in morning session from 6.00 to 7.00 A.M. The total duration of training will be for 6 weeks period.

Content of yogasanas training programme

The content of yogasanas training programme consists of selected asana. The schedule of yogasanasprogramme is given below

THE DESIGN OF TRAINING SCHEDULE FOR YOGASANAS

YOGASANAS FROM 1 TO 6 WEEKS

Sl. No.	Name of the Yogasanas	Repetitions	Duration in Minutes
1	General warming up and stretching exercise	----------	12 min
2	Utkatasana	6 Rounds	6 min
3	Virabhadrasana II	3 Rounds one leg, Both leg(3+3=6)	6 min
4	Urdhvaprasaritaekapadasana six	3Round one leg, Both leg(3+3=6	6 min
5	Dolasana (pendulum pose)	3Round one leg Both leg(3+3=6)	6 min
6	Poorna Titali Asana (full butterfly)	6 Round	6 min
7	Utthitatrikasan (Extended triangle pose)	3 Round one leg, Both leg(3+3=6)	6 min
8	Pindanguli-Sakti-Vikasaka	6 Round	6 min
9	Pada-Mula-Sakti-Vikasaka	6 Round	6 min
	TOTAL		60minutes

PHASE-III: POST-TEST

The post-test in the all selected variables will be conducted on the subjects after completion of experimental treatment period of 6 weeks. The procedure of post-test will same like the pre-test.

Statistical Technique for Analysis of the data

The collected data will be analyzed by using statistical technique i.e., ANCOVA, dependent‘t’ test and Pearson correlation coefficient at 0.05 level of significance.

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